as disclosed above for dynamic assignment and reassignment of codes. In like manner as to codes, in a preferred embodiment, the limited set may comprise three frequencies, and up to two such closest frequencies may be determined.

(3) If the region 301 comprises both the first system 302 and the second system 303, frequencies may be assigned dynamically. All of the base station 204 transmitters and all of the user station 202 transmitters in each cell 203 use a single frequency, selected from a limited set. Each base station 204 dynamically determines those frequencies from the limited set which are in closest use to it, and selects one of the remaining frequencies for use in the cell 203. The base station 204 transmitters and the user station 202 transmitters may be time-division duplexed. (Time-division duplexing is well known in the art.) In like manner as to codes, in a preferred embodiment, the limited set may comprise three frequencies, and up to two such closest frequencies may be determined.

The amount of separation required between frequencies (while also using code-division and time-division techniques) is dependent upon distance between the user stations 202 in each cell 203, as well as upon the technique used for modulation and demodulation encoded signals. As is well known in the art, some modulation techniques allow for overlapping wideband signals whose center frequencies are offset by a minimum amount necessary to distinguish between otherwise cross-correlating signals. In a preferred embodiment, such modulation techniques may be used, allowing more efficient use of frequency spectrum and allowing frequencies to be reused at closer proximity.

Alternative Embodiments

While preferred embodiments are disclosed herein, many variations are possible which remain within the concept and scope of the invention, and these variations would become clear to one of ordinary skill in the art after perusal of the specification, drawings and claims herein.

For example, it would be clear to one of ordinary skill in the art, after perusal of the specification, drawings and claims herein, that other and further techniques, such as adjustable power control, cell sectoring, directional antennas, and antennae diversity, may be used to enhance a wireless communication system embodying the principles of the invention. Moreover, it would be clear to one of ordinary skill that a system also employing such other and further techniques would be workable, and is within the scope and spirit of the invention.

I claim:

1. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station and said user stations communicate using time division multiple access;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned a second transmission frequency for transmitting to said base station for the respective first cell, said second transmission frequency not being assigned to any user station in any cell in said pattern of cells adjacent to said first cell.

2. The wireless communication system of claim 1, wherein said first transmission frequency is from a first set

comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies, whereby said first set of frequencies is different than said second set of frequencies.

3. The wireless communication system of claim 2, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

4. The wireless communication system of claim 1, wherein said base station is dynamically assigned said first transmission frequency.

5. The wireless communication system of claim 1, wherein the user stations in said first cell are dynamically assigned said second transmission frequency.

6. The wireless communication system of claim 1, wherein transmissions between said base station transmitting to said first cell and the user stations in said first cell are time division duplexed.

7. A wireless communication system, comprising:

a pattern of cells;

one or more base stations; and

one or more user stations;

wherein said base stations and said user stations communicate using time division multiple access;

wherein a base station which transmits to a first cell in said pattern of cells is assigned a first transmission frequency for transmitting to said first cell, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned said first transmission frequency for transmitting to said base station which transmits to said first cell;

wherein the communications between said base station which transmits to said first cell and the user stations in said first cell are time division duplexed.

8. The wireless communication system of claim 7, wherein a user station in said first cell transmits data communication messages which include station identification information.

9. The wireless communication system of claim 7, wherein said base station which transmits to said first cell is dynamically assigned said first transmission frequency.

10. The wireless communication system of claim 7, wherein a user station is dynamically assigned said first transmission frequency when it enters said first cell.

11. The wireless communication system of claim 7, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells, and no member of said third class of cells is adjacent to another member of said third class of cells.

12. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission frequency not assigned to any user stations in any cell in said pattern of cells adjacent said first cell;

wherein said base station is further assigned a first spread spectrum code for modulating radio communication for said first cell; and

wherein said user stations in said first cell are each assigned a second spread spectrum code for modulating radio communication from said first cell.

13. The wireless communication system of claim 12, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies.

14. The wireless communication system of claim 13, whereby the frequencies of said first set of frequencies are mutually exclusive of the frequencies of said second set of frequencies.

15. The wireless communication system of claim 13, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

16. The wireless communication system of claim 12, wherein said base station is dynamically assigned said first transmission frequency.

17. The wireless communication system of claim 12, wherein a user station is dynamically assigned said second transmission frequency when it enters said first cell.

18. The wireless communication system of claim 12, wherein each base station servicing said pattern of cells uses said first spread spectrum code for modulating radio communication for said pattern of cells and wherein each user station in said pattern of cells uses said second spread spectrum code for modulating radio communications from said pattern of cells.

19. The wireless communication system of claim 12, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells and no member of said third class of cells is adjacent to another member of said third class of cells.

20. The wireless communication system of claim 12, wherein said first spread spectrum code and said second spread spectrum code comprise a set of codes with minimal cross-correlation attributes.

* * * * *

CLAIMS

I claim:

1. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base and said user stations communicate using time division multiple access;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned a second transmission frequency for transmitting to said base station for the respective first cell, said second transmission frequency not being assigned to any user station in any cell in said pattern of cells adjacent to said first cell.

2. A wireless communication system of claim 1, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency is from a second set comprised of a limited second predetermined number of frequencies, whereby said first set of frequencies is different than said second set of frequencies.

3. The wireless communication system of claim 2, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

4. The wireless communication system of claim 1, wherein said base station is dynamically assigned said first transmission frequency.

5. The wireless communication system of claim 1, wherein the user stations in said first cell are dynamically assigned said second transmission frequency.

6. The wireless communication system of claim 1, wherein transmissions between said base station transmitting to said first cell and the user stations in said first cell are time division duplexed.

7. A wireless communication system, comprising:

a pattern of cells;

one or more base stations; and

one or more user stations;

wherein said base stations and said user stations communicate using time division multiple access;

wherein a base station which transmits to a first cell in said pattern of cell is assigned a first transmission frequency for transmitting to said first cell, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent to said first cell;

wherein each user station in said first cell is assigned said first transmission frequency for transmitting to said base station which transmits to said first cell;

wherein the communication between said base station which transmits to said first cell and the user stations in said first cell are time division duplexed.

8. The wireless communication system of claim 7, wherein a user station in said first cell transmits data communication messages which include station identification information.

9. The wireless communication system of claim 7, wherein said base station which transmits to said first cell is dynamically assigned said first transmission frequency.

10. The wireless communication system of claim 7, wherein a user station is dynamically assigned said first transmission frequency when it enters said first cell.

11. The wireless communication system of claim 7, wherein said pattern of cells comprises a repeated pattern of cells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells, no member of said second class of cells is adjacent to another member of said second class of cells, and no member of said third class of cells is adjacent to another member of said third class of cells.

12. A wireless communication system, comprising:

a pattern of cells;

a base station; and

one or more user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said pattern of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said pattern of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission

frequency not assigned to any user stations in any cell in said pattern of cells adjacent said first cell;

wherein said base station is further assigned a first spread spectrum code for modulating radio communication for said first cell; and

wherein said user stations in said first cell are each assigned a second spread spectrum code for modulating radio communication from said first cell.

13. The wireless communication system of claim 12, wherein said first transmission frequency is from a first set comprised of a limited first predetermined number of frequencies and wherein said second transmission frequency if from a second set comprised of a limited second predetermined number of frequencies.

14. The wireless communication system of claim 13, whereby the frequencies of said first set of frequencies are mutually exclusive of the frequencies of said second set of frequencies.

15. The wireless communication system of claim 13, wherein said first predetermined number of frequencies is three and said second predetermined number of frequencies is three.

16. The wireless communication system of claim 12, wherein said base station is dynamically assigned said first transmission frequency.

17. The wireless communication system of claim 12, wherein a user station is dynamically assigned said second transmission frequency when it enters said first cell.

18. The wireless communication system of claim 12, wherein each base station servicing said pattern of cells uses said first spread spectrum code for modulating radio communication for said pattern of cells uses said second spread spectrum code for modulating radio communications from said pattern of cells.

19. The wireless communication system of claim 12, wherein said pattern of cells comprises a repeated pattern of ells consisting essentially of a first class of cells, a second class of cells, and a third class of cells, wherein no member of said first class of cells is adjacent to another member of said first class of cells, no member of second class of cells is adjacent to another member of said second class of cells and no member of said third class of cells is adjacent to another member of said third class of cells.

20. The wireless communication system of claim 12, wherein said first spread spectrum code and said second spread spectrum code comprises a set of codes with minimal cross-correlation attributes.

21. A multiple user wireless communication system, comprising:

a plurality of cells;

a base station located in each cell;

wherein transmitters in a first cell are assigned a first code for modulating radio communication in said first cell;

whereby radio signals used in said first cell are spread across a bandwidth sufficiently wide that receivers in a second cell, said second cell being adjacent to said first cell, may

distinguish communication which originates in said first cell from communication which originates in said second cell;

whereby said first cell using said first code is not adjacent to any other cell using said first code;

wherein said base station transmits over a first frequency; and

wherein user stations in communication with said base station transmit over a second frequency different from said first frequency.

22. The multiple user wireless communication system of claim 17, wherein said base station communicates with said user stations using time division duplexing.

23. A wireless communication system, comprising:

a plurality of cells;

a base station; and

a plurality of user stations;

wherein said base station is assigned a first transmission frequency for transmitting to a first cell in said plurality of cells, said first transmission frequency not being assigned to any base station for transmitting to any cell in said plurality of cells adjacent said first cell;

wherein said user stations in said first cell are assigned a second transmission frequency, said second transmission frequency not assigned to any user stations in any cell in said plurality of cells adjacent said first cell;

wherein said base station and said user stations in said first cell are assigned one or more distinct codes for modulating radio communication for said first cell.

24. The wireless communication system of claim 19, wherein said base station is assigned a first set of one or more distinct spreading codes for communicating with user stations in said first cell, said first set of one or more distinct spreading codes not being assigned to any base station for communicating in any cell in said plurality of cells adjacent said first cell, and wherein said user stations in said first cell are assigned a second set of one or more distinct spreading codes, said second set of one or more distinct spreading codes not assigned to any user stations in any cell in said plurality of cells adjacent said first cell.

25. The wireless communication system of claim 19, wherein said base station communicates with said user stations using time division duplexing.